

Cylindrical Capacitive Proximity Sensors

CR Series (AC 2-wire) INSTRUCTION MANUAL

DRW201184AA

Autonics

Thank you for choosing our Autonics product.

Read and understand the instruction manual and manual thoroughly before using the product.

For your safety, read and follow the below safety considerations before using.

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

Keep this instruction manual in a place where you can find easily.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Follow Autonics website for the latest information.

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)

Failure to follow this instruction may result in personal injury, economic loss or fire.

02. Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.

Failure to follow this instruction may result in explosion or fire.

03. Do not disassemble or modify the unit.

Failure to follow this instruction may result in fire.

04. Do not connect, repair, or inspect the unit while connected to a power source.

Failure to follow this instruction may result in fire.

05. Check 'Connections' before wiring.

Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. Use the unit within the rated specifications.

Failure to follow this instruction may result in fire or product damage.

02. Use a dry cloth to clean the unit, and do not use water or organic solvent.

Failure to follow this instruction may result in fire.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Wire as short as possible and keep away from high voltage lines or power lines, to prevent surge and inductive noise.
Do not use near the equipment which generates strong magnetic force or high frequency noise (transceiver, etc.).
In case installing the product near the equipment which generates strong surge (motor, welding machine, etc.), use diode or varistor to remove surge.
- Do not connect capacity load to the output terminal directly.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude max. 2,000 m
 - Pollution degree 2
 - Installation category II

Cautions for Installation

- Install the unit correctly with the usage environment, location, and the designated specifications.
- Do NOT impacts with a hard object or excessive bending of the wire lead-out. It may cause damage the water resistance.
- Do NOT pull the $\varnothing 3.5$ mm cable with a tensile strength of 25 N, the $\varnothing 4$ mm cable with a tensile strength of 30 N or over and the $\varnothing 5$ mm cable with a tensile strength of 50 N or over. It may result in fire due to the broken wire.
- When extending wire, use AWG 22 cable or over within 200 m.

Ordering Information

This is only for reference.

For selecting the specific model, follow the Autonics web site.

CR ① - ② A ③

① DIA. of sensing side

Number: DIA. of sensing side (unit: mm)

③ Control output

O: Normally Open

C: Normally Closed

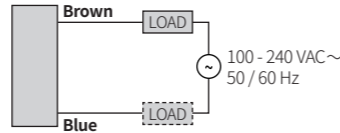
② Sensing distance

Number: Sensing distance (unit: mm)

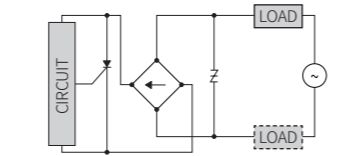
Connections

- LOAD can be wired to any direction.
- Connect LOAD before supplying the power.

■ Cable type



■ Inner circuit



Operation Timing Chart

	Normally open	Normally closed
Sensing target	Presence Nothing	Presence Nothing
Load	Operation Return	Operation Return
Operation indicator (red)	ON OFF	ON OFF

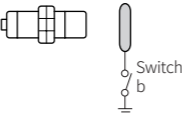
Sold Separately

- Connector cable, connector connection cable
- Transmission coupler
- Spatter protection cover
- Fixed bracket

Grounding

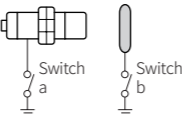
The sensing distance will be changed by grounding status of capacity proximity sensor and the target [50 × 50 × 1 mm (iron)]. Check the material when installing the sensor and selecting the target.

■ CR18-8A□



Ground condition (switch b)	ON	OFF
Operating distance (mm)	8	4

■ CR30-15A□



Ground condition	Switch a	ON	OFF	ON	OFF
	Switch b	ON	ON	OFF	OFF
Operating distance (mm)	15	18	6	6	

Specifications

Installation	Non-flush type	
Model	CR18-8A□	CR30-15A□
DIA. of sensing side	$\varnothing 18$ mm	$\varnothing 30$ mm
Sensing distance	8 mm	15 mm
Setting distance	0 to 5.6 mm	0 to 10.5 mm
Hysteresis	$\leq 20\%$ of sensing distance	
Standard sensing target: iron	50 × 50 × 1 mm	
Response frequency (01)	20 Hz	
Affection by temperature	$\leq \pm 20\%$ for sensing distance at ambient temperature 20 °C	
Indicator	Operation indicator (red)	
Approval	ERC	ERC
Unit weight (package)	≈ 70 g (≈ 82 g)	≈ 200 g (≈ 237 g)

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Power supply	100-240 VAC ~ 50 / 60 Hz, operating voltage: 85 - 264 VAC ~
Leakage current	≤ 2.2 mA
Control output	≤ 5 to 200 mA
Residual voltage	≤ 20 V
Protection circuit	Surge protection circuit
Insulation resistance	≥ 50 M Ω (500 VDC = megger)
Dielectric strength	1,500 VAC ~ 50/60Hz for 1 min (between all terminals and case)
Vibration	1 mm amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s ² (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient temperature	-25 to 70 °C, storage: -30 to 80 °C (non-freezing or non-condensation)
Ambient humidity	35 to 95 %RH, storage: 35 to 95 %RH (non-freezing or non-condensation)
Protection structure	DIA. of sensing side $\varnothing 18$ mm: IP66 (IEC standard) / DIA. of sensing side $\varnothing 30$ mm: IP65 (IEC standard)
Connection	Cable type
Cable spec.	DIA. of sensing side $\varnothing 18$ mm: $\varnothing 4$ mm, 2-wire, 2 m DIA. of sensing side $\varnothing 30$ mm: $\varnothing 5$ mm, 2-wire, 2 m
Wire spec.	AWG 22 (0.08 mm, 60-wire), insulator DIA.: $\varnothing 1.25$ mm
Material	Standard type cable (black): polyvinyl chloride (PVC)
DIA. of sensing side $\varnothing 18$ mm	Case / Nut: PA6
DIA. of sensing side $\varnothing 30$ mm	Case / Nut: nickel-plated brass, washer: nickel-plated iron, sensing side: PBT

Sensitivity Adjustment

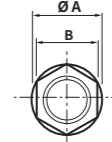
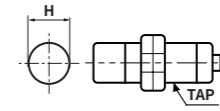
Please turn potentention VR to set sensitivity as below procedure.

- When there is distance fluctuation between proximity sensor and the target, please adjust 2 at the farthest distance from this unit.
- Turning potentention VR toward clockwise, it will be max., or turning toward counter clockwise, it will be min. The number of adjustment should be 15 ± 3 revolution and if it is turned to the right or left excessively, it will not stop, but it idles without breakdown.
- () is for Normally closed type.

Procedure	Potentention VR	Description
1	Stop at ON (OFF) position	Without a sensing object, turn the potentention VR to the right and stop at the proximity sensor is ON (OFF).
2	Stop at OFF (ON) position	Put the object in right sensing position, turn the potentention VR to the left and stop at the proximity sensor is OFF (ON).
3	OFF (ON) position ON (OFF) position	It is stable when it is over 1.5 times If the difference of the number of potentention VR rotation between the ON (OFF) point and the OFF (ON) point is more than 1.5 turns, the sensing operation will be stable.
4	Adjustment completed OFF (ON) position ON (OFF) position	If it is set in sensitivity adjustment position of potentention VR at center between 1 and 2, sensitivity setting will be completed.

Cut-out Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics web site.



	$\varnothing 18$ mm	$\varnothing 30$ mm
Mounting hole (H)	$\varnothing 18.5^{+0.5}_0$	$\varnothing 30.5^{+0.5}_0$
TAP	M18×1	M30×1.5

	$\varnothing 18$ mm	$\varnothing 30$ mm
Ø A	26.5	42
B	24	35

Mutual-interference & Influence by Surrounding Metals

■ Mutual-interference

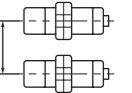
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

Therefore, be sure to provide a minimum distance between the two sensors, as below table.

[Face to Face]

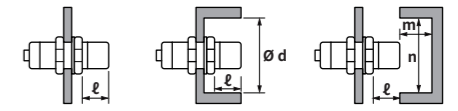


[Parallel]



■ Influence by surrounding metals

When sensors are mounted on metallic panel, it must be prevented sensors from being affected by any metallic object except target. Therefore, be sure to provide a minimum distance as below chart.



(unit: mm)

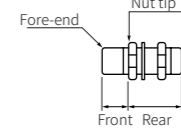
Item	Sensing side	$\varnothing 18$ mm	$\varnothing 30$ mm
A		48	90
B		54	90
l		20	10
Ø d		54	90
m		24	45
n		54	90

Tightening Torque

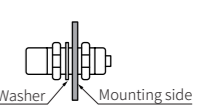
Use the provided washer to tighten the nuts.

The tightening torque of the nut varies with the distance from the fore-end. [Figure 1] If the nut tip is located at the front of the product, apply the front tightening torque. The allowable tightening torque table is for inserting the washer as [Figure 2].

[Figure 1]



[Figure 2]



Sensing side	$\varnothing 18$ mm	$\varnothing 30$ mm
Strength	-	12 mm
Front torque	0.39 N m	49 N m
Rear torque	0.39 N m	78.4 N m

Cylindrical Capacitive Proximity Sensors

CR Series (DC 3-wire)

INSTRUCTION MANUAL

DRW201185AA

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⚠ Warning Failure to follow instructions may result in serious injury or death.

01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)

Failure to follow this instruction may result in personal injury, economic loss or fire.

02. Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.

Failure to follow this instruction may result in explosion or fire.

03. Do not disassemble or modify the unit.

Failure to follow this instruction may result in fire.

04. Do not connect, repair, or inspect the unit while connected to a power source.

Failure to follow this instruction may result in fire.

05. Check 'Connections' before wiring.

Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. Use the unit within the rated specifications.

Failure to follow this instruction may result in fire or product damage.

02. Use a dry cloth to clean the unit, and do not use water or organic solvent.

Failure to follow this instruction may result in fire.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- 12 - 24 VDC= power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Use the product, after 0.8 sec of supplying power.
- Wire as short as possible and keep away from high voltage lines or power lines, to prevent surge and inductive noise.
Do not use near the equipment which generates strong magnetic force or high frequency noise (transceiver, etc.).
In case installing the product near the equipment which generates strong surge (motor, welding machine, etc.), use diode or varistor to remove surge.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude max. 2,000 m
 - Pollution degree 2
 - Installation category II

Cautions for Installation

- Install the unit correctly with the usage environment, location, and the designated specifications.
- Do NOT impacts with a hard object or excessive bending of the wire lead-out. It may cause damage the water resistance.
- Do NOT pull the $\varnothing 3.5$ mm cable with a tensile strength of 25 N, the $\varnothing 4$ mm cable with a tensile strength of 30 N or over and the $\varnothing 5$ mm cable with a tensile strength of 50 N or over. It may result in fire due to the broken wire.
- When extending wire, use AWG 22 cable or over within 200 m.

Ordering Information

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For selecting the specific model, follow the Autonics web site.

CR	①	-	②	D	③
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① DIA. of sensing side

Number: DIA. of sensing side (unit: mm)

③ Control output

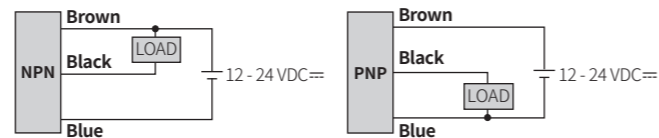
N: NPN Normally open
N2: NPN Normally closed
P: PNP Normally open

② Sensing distance

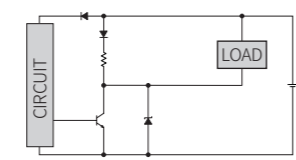
Number: Sensing distance (unit: mm)

Connections

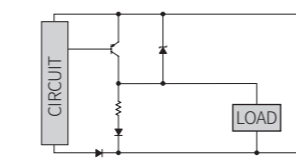
■ Cable type



■ Inner circuit (NPN output)



■ Inner circuit (PNP output)



Operation Timing Chart

	Normally open	Normally closed
Sensing target	Presence Nothing	Presence Nothing
Load	Operation Return	Operation Return
Output voltage	NPN output H L	H L
	PNP output H L	H L
Operation indicator (red)	ON OFF	ON OFF

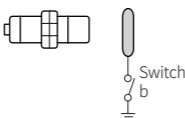
Sold Separately

- Connector cable, connector connection cable
- Transmission coupler
- Spatter protection cover
- Fixed bracket

Grounding

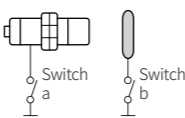
The sensing distance will be changed by grounding status of capacity proximity sensor and the target [50 × 50 × 1 mm (iron)]. Check the material when installing the sensor and selecting the target.

■ CR18-8D□



Ground condition (switch b)	ON	OFF
Operating distance (mm)	8	4

■ CR30-15D□



Ground condition	Switch a	ON	OFF	ON	OFF
	Switch b	ON	ON	OFF	OFF
Operating distance (mm)	15	18	6	6	

Specifications

Installation	Non-flush type	
Model	CR18-8D□	CR30-15D□
DIA. of sensing side	$\varnothing 18$ mm	$\varnothing 30$ mm
Sensing distance	8 mm	15 mm
Setting distance	0 to 5.6 mm	0 to 10.5 mm
Hysteresis	≤ 20% of sensing distance	
Standard sensing target: iron	50 × 50 × 1 mm	
Response frequency⁰¹⁾	50 Hz	
Affection by temperature	≤ ± 20% for sensing distance at ambient temperature 20 °C	
Indicator	Operation indicator (red)	
Approval	ERC	ERC
Unit weight (package)	≈ 76 g (≈ 88 g)	≈ 206 g (≈ 243 g)

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Power supply	12 - 24 VDC= (ripple P-P: ≤ 10%), operating voltage: 10 - 30 VDC=
Current consumption	≤ 15 mA
Control output	≤ 200 mA
Residual voltage	≤ 1.5 V
Protection circuit	Surge protection circuit, reverse polarity protection
Insulation resistance	≥ 50 M Ω (500 VDC= megger)
Dielectric strength	1,500 VAC~ 50/60Hz for 1 min (between all terminals and case)
Vibration	1 mm amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s ² (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient temperature	-25 to 70 °C, storage: -30 to 80 °C (non-freezing or non-condensation)
Ambient humidity	35 to 95 %RH, storage: 35 to 95 %RH (non-freezing or non-condensation)
Protection structure	DIA. of sensing side $\varnothing 18$ mm: IP66 (IEC standard) / DIA. of sensing side $\varnothing 30$ mm: IP65 (IEC standard)
Connection	Cable type
Cable spec.	DIA. of sensing side $\varnothing 18$ mm: $\varnothing 4$ mm, 3-wire, 2 m DIA. of sensing side $\varnothing 30$ mm: $\varnothing 5$ mm, 3-wire, 2 m
Wire spec.	AWG 22 (0.08 mm, 60-wire), insulator DIA.: $\varnothing 1.25$ mm
Material	Standard type cable (black): polyvinyl chloride (PVC)
DIA. of sensing side $\varnothing 18$ mm	Case / Nut: PA6
DIA. of sensing side $\varnothing 30$ mm	Case / Nut: nickel-plated brass, washer: nickel-plated iron, sensing side: PBT

Sensitivity Adjustment

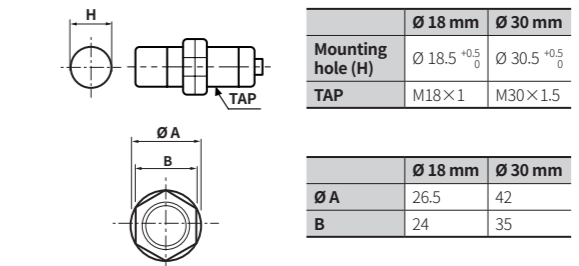
Please turn potentention VR to set sensitivity as below procedure.

- When there is distance fluctuation between proximity sensor and the target, please adjust 2 at the farthest distance from this unit.
- Turning potentention VR toward clockwise, it will be max., or turning toward counter clockwise, it will be min. The number of adjustment should be 15 ± 3 revolution and if it is turned to the right or left excessively, it will not stop, but it idles without breakdown.
- () is for Normally closed type.

Procedure	Potentention VR	Description
1	Stop at ON (OFF) position	Without a sensing object, turn the potentention VR to the right and stop at the proximity sensor is ON (OFF).
2	Stop at OFF (ON) position	Put the object in right sensing position, turn the potentention VR to the left and stop at the proximity sensor is OFF (ON).
3	It is stable when it is over 1.5 times OFF (ON) position ON (OFF) position	If the difference of the number of potentention VR rotation between the ON (OFF) point and the OFF (ON) point is more than 1.5 turns, the sensing operation will be stable.
4	Adjustment completed OFF (ON) position ON (OFF) position	If it is set in sensitivity adjustment position of potentention VR at center between 1 and 2, sensitivity setting will be completed.

Cut-out Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics web site.

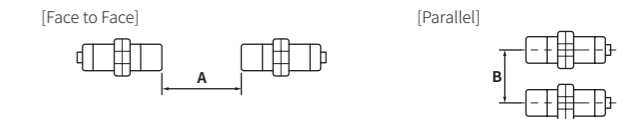


Mutual-interference & Influence by Surrounding Metals

■ Mutual-interference

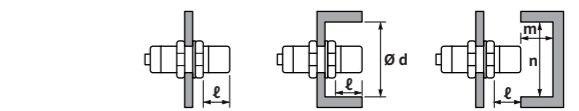
When plural proximity sensors are mounted in a close row, malfunction of sensor may be caused due to mutual interference.

Therefore, be sure to provide a minimum distance between the two sensors, as below table.



■ Influence by surrounding metals

When sensors are mounted on metallic panel, it must be prevented sensors from being affected by any metallic object except target. Therefore, be sure to provide a minimum distance as below chart.



(unit: mm)

Item	Sensing side	$\varnothing 18$ mm	$\varnothing 30$ mm
A		48	90
B		54	90
ℓ		20	10
$\varnothing d$		54	90
m		24	45
n		54	90

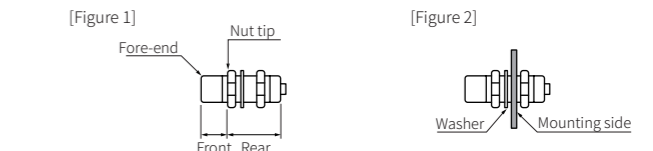
Tightening Torque

Use the provided washer to tighten the nuts.

The tightening torque of the nut varies with the distance from the fore-end. [Figure 1]

If the nut tip is located at the front of the product, apply the front tightening torque.

The allowable tightening torque table is for inserting the washer as [Figure 2].



	Sensing side	$\varnothing 18$ mm	$\varnothing 30$ mm
Strength			
Front size		-	12 mm
Front torque		0.39 N m	49 N m
Rear torque		0.39 N m	78.4 N m